

PROXIMATE AND SENSORY ANALYSIS OF CHICKEN EGG PICKLE

SANDEEPPAL KAUR BRAR¹, RAVNEET SINGH² & S. S THIND³

¹Junior Research Fellow, College of Dairy Science and Technology, Guru AngadDev Veterinary and Animal Sciences, Ludhiana, Punjab, India

²Research Associate, College of Dairy Science and Technology, Guru AngadDev Veterinary and Animal Sciences, Ludhiana, Punjab, India

³Professors, Department of Food Science and Technology, Punjab Agricultural University Ludhiana, Punjab, India

ABSTRACT

The objective of this study was to evaluate the quality and stability of the chicken egg pickle in four different refined vegetable oils (mustard oil, groundnut oil, soyabean oil and palm oil). The optimized conditions for the hard cooking of eggs were, simmering in hot water (90°C) for 30 mins. Peeled hard cooked eggs were cooled and dipped in 2% food grade glacial acetic acid (vinegar) for 48 hrs prior to egg pickle preparation. The chicken egg pickle was stored at ambient (25-28°C) and refrigeration (5-7°C) temperatures. The prepared egg pickle was packed in glass containers. During the storage egg pickle was evaluated at regular intervals of 30 days for proximate composition and organoleptic were evaluated after every 15 days interval. Significant variations ($p < 0.05$) were observed for moisture content, protein and fat content of chicken egg pickle during storage. Non-significant variations ($p < 0.05$) were observed in the ash content of the chicken egg pickle. The average appearance, color, flavor, taste and overall acceptability scores decreased significantly ($p < 0.05$) during storage with minimum decline being observed in egg pickle marinated in palm oil followed by egg pickle in groundnut, mustard and soyabean oils stored at ambient temperature. The chicken egg pickle stored at ambient (25-28°C) temperature was found organoleptically acceptable upto one month of storage.

KEYWORDS: Egg Pickle, Hard Cooked Eggs, Oil Pickle, Mustard Oil, Soyabean Oil, Palm Oil and Groundnut Oil

INTRODUCTION

Poultry is one of the fastest growing segments of the Indian agriculture. The production of agricultural crops has been rising at the rate of 1.5 to 2 per cent per annum while the production of eggs has been increasing at a rate of 8 to 10 per cent per annum. The country ranks fourth in the world in terms of egg production with total poultry population of 489 million producing 51200 million eggs. (www.icra.in). Punjab is one of the most important poultry producing states in the country. The state has a layer population of 12.5 million producing around 4400 million eggs annually. Per capita egg consumption in Punjab (141 eggs) is the higher as compared to the national average of 42 eggs. (mofpi.nic.in).

Chicken eggs have a high nutritive value. The chicken egg is one of the most complete foods available in nature. Egg is an important source of high quality nutrients containing around 12 percent proteins, 11.5 percent fats, minerals and vitamins. Biological value of egg protein is 97 as compared to 84 for vegetable proteins. Because of the excellent balance of amino acids in egg protein, eggs are used as a standard with chemical score of 100 and also have a high PER (Protein efficiency ratio) of 4.5 (Swaminathan 2003). Low calorific value, ease of digestibility and high nutrient content make eggs valuable in many therapeutic diets for adults. Eggs contain nutrients which are essential during rapid body growth and

therefore are excellent food for young children and teenagers.

Pickling is a global culinary art. Pickling is a process of preserving perishable food in vinegar and/or oil with added spices, salt and condiments in the form of a ready to eat product. Egg pickle is a comparatively new product. Egg pickle can be prepared from chicken, duck or quail eggs, depending on their availability and acceptability. Egg pickle is novel food product having a relatively long shelf life at ambient temperature. Egg pickling is the process of preserving hard cooked egg in vinegar and/oil with added spices, salt and condiments in the form of ready to eat product. The egg pickle has advantage over other methods of eggs preservation as it does not require refrigeration or freezing conditions during storage and its spicy sensory characteristics make it desirable to Indian palate.

MATERIALS AND METHODS

The present investigation was conducted in the Department of Food Science and Technology, College of Agriculture, Punjab Agricultural University, Ludhiana.

Raw Materials

White shelled chicken eggs from white leghorn breed were purchased from Bromark outlet in Ludhiana market. The eggs were kept in refrigerator (5-7 °C) for 72 hours prior to the preparation of egg pickle. The weight of the eggs ranged between 55-60 grams. Dhara refined mustard oil, Ginni refined groundnut oil, Fortune refined soyabean oil and Ruchi Gold refined palm oil were procured from the local Ludhiana market. Cinnamon, coriander and chili powders of MDH brand were purchased from the local market. Table salt of TATA brand, cumin seeds, turmeric and black pepper of CATCH brand were purchased from the local market. Unbranded cloves were procured from the local Ludhiana market. The ginger and garlic paste ("HOME MADE"-Brand) in tetra packs was purchased from the local market. Raw onions were procured from the local market. The onions were peeled and ground to paste in food processor (Inalsa, Max Plus).

Packaging Material

Glass containers of 500 ml capacity with screwable PET lids were used for the packaging of chicken egg pickle. These containers were purchased from local market.

Proximate Composition of Chicken Egg Pickle

Proximate composition of chicken egg pickle was determined by following methods.

Moisture

Chicken egg pickle sample (10g) was dried in a clean, dry and pre-weighed moisture dish and kept in with lid removed at 100- 105°C for 16-18 hours in hot air oven. After cooling in desiccators, loss in weight was calculated as moisture of sample and expressed as per cent moisture.

Moisture % =	Weight of fresh sample (g) – Weight of dried sample	x 100
	Weight of fresh sample (g)	

Protein

Macro kjeldahl method was used for determination of protein (AOAC 2000). Chicken egg pickle sample (0.2 g) weighed was digested in kjeldahl flask with digestion mixture (copper sulphate and potassium sulphate in 1:10 ratio) and

concentrated H_2SO_4 (20 ml) till light green color and cooled. Ammonia released by distillation of digested sample with saturated NaOH (80 ml) was captured in 0.1N HCL to calculate per cent nitrogen (N_2). The per cent nitrogen was converted into per cent protein as:

$$\% \text{ protein} = \% \text{ nitrogen} \times 6.25$$

Fat

Fat was extracted from dried sample of chicken egg pickle with the help of Soxhlet Apparatus. Weighed sample was taken in thimbles and extracted using petroleum ether (boiling point $60\text{--}80^\circ\text{C}$) for 16 hours. The extract containing fat and petroleum ether was evaporated over steam bath and dried in oven at low temperature (50°C), weighed and per cent fat was calculated.

% Fat =	Weight of fat (g)	X 100
	Weight of sample (g)	

Ash

Ash content was determined by placing the charred chicken egg pickle samples in silica dishes and heated in muffle furnace at 525°C for 6 hrs until white color ash was obtained to a constant weight.

% ash =	Weight of ash (g)	x 100
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Weight of sample (g)

Total Viable Count (TVC)

The microbiological analysis (TVC) of the chicken egg pickle was conducted by standard pour plate method (APHA 1984). 25g of sample was aseptically mixed with 225 ml of sterile distilled water (pH 7 and 0.8% NaCl) and blended for 4 hours. This provided 10^{-1} dilution, further dilutions were prepared under aseptic conditions in the same manner. One ml of diluted sample was poured in each petri plate and mixed with Nutrient agar. The plate was rotated clockwise and anticlockwise for uniform distribution of inoculum in Nutrient agar. After solidification of the medium in the plates, the plates were incubated at 37°C in inverted position for 48 hours. After incubation, colonies were counted and expressed as:

$$\text{TVC/g} = \text{Mean colony count} \times \text{dilution factor}$$

Organoleptic Evaluation

The chicken egg pickle was organoleptically evaluated on the day of preparation and at every 30 days interval during the storage period. An eight member semi-trained sensory panel was selected from the faculty members of PAU and PG students. Nine-point Hedonic scale was used for evaluation of chicken egg pickle for appearance, color, flavor, texture, juiciness and overall acceptability (Larmond 1970)

Storage Studies

The Chicken egg pickles in different oils were packed in glass containers. Chicken egg pickle were stored at ambient ($25\text{--}28^\circ\text{C}$) temperature. Estimation for changes in moisture content, protein content, fat and ash content were conducted at regular intervals of 30 days and Microbial analysis at an interval of 15 days.

Statistical Analysis

The data on the proximate composition, microbial quality and organoleptic scores of chicken egg pickle were statistically analysed and subjected to analysis of variance using completely randomized design (CRD) using the software CPCS-1 (Singh *et al* 1991). Each value is mean of three observations.

Preparation of Chicken Egg Pickle

The raw eggs stored in refrigerator were placed at ambient temperature half an hour prior to hard cooking. The eggs were hard cooked at 90 °C for 30 min. The eggs were cooled under running tap water for 2 minutes. The cooled eggs were peeled and dipped in vinegar [food grade glacial acetic acid (2%)] for 48 hrs. The eggs were taken out and pricked. Oil was heated in pan to smoking point, cumin seeds were added followed by onion, ginger and garlic paste and cooked till color turned golden brown. The remaining spices were added and heated for 2 min. Acid dipped hard cooked chicken eggs were pricked and mixed with cooked spice and heated till the paste stopped sticking to the pan and left the oil. The pickle was covered and cooled to ambient temperature. The pickle was packed in glass containers (450gms net weight) and store at ambient temperature. It was ensured during packaging that the eggs remained covered with oil during storage.

Standardization of Product Preparation

The recipe of chicken egg pickle preparation was standardized by consulting literature and by taking the opinion of taste panel members during trials of product preparation for the standardization of the recipe and the process. The process for the hard cooking of eggs was standardized by placing eggs in simmering water (90°C) for different time intervals (20, 25, 30 and 35 minutes). The eggs were dipped in food grade glacial acetic acid for 48 hours at concentrations of 1%, 2% and 3% to standardize the acid concentration. The standardization process also helped in the training of the taste panel members. On the basis of sensory evaluation results of the egg pickle, best level of glacial acetic acid 2% was used in the preparation of final product i.e. chicken egg pickle. Chicken egg pickle was prepared using four different refined vegetable oils (mustard, groundnut, soya bean and palm oil). The chicken egg pickle was packed in glass containers and stored at room (25-28 °C) temperature.

RESULTS AND DISCUSSIONS

Moisture

There was significant decrease ($p < 0.05$) in moisture content of the egg albumen during storage at ambient temperature. The average moisture content of egg albumen on the preparation day was 86.31, 85.89, 87.03 and 86.49 percent in egg pickle marinated in mustard oil, groundnut oil, soya bean oil and palm oil respectively. The moisture content of albumen in egg pickle decreased significantly ($p < 0.05$) to 79.41, 78.86, 84.28 and 78.22 percent in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively after 30 days storage at ambient temperature. There was non significant increase ($p < 0.05$) in moisture content of the egg yolk during storage at ambient temperature. The average moisture content of egg yolk on the preparation day was 46.78, 48.44, 47.76 and 46.92 percent in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively. The moisture content of yolk in egg pickle increased non significantly ($p < 0.05$) to 49.23, 51.03, 50.92 and 48.11 percent in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively after 30 days storage at ambient temperature. (Table 2)

The decrease in percent moisture content for albumen and the increase in percent moisture content for yolk were non significant ($p < 0.05$) between the oils used during storage period of egg pickles. The decrease in moisture content of egg

albumen and increase in moisture content of egg yolk was attributed to the movement of moisture from higher level(albumen) to lower level(yolk) during storage. The loss in moisture content of egg white could be due to syneresis. Similar changes in moisture content of egg albumen and egg yolk due to osmosis was observed by Ball and Saffores (1973) and Arafa (1983).

Protein Content

There was significant increase ($p<0.05$) in protein content of the egg albumen during storage. The average protein content of egg albumen on the preparation day was 9.41, 8.96, 9.27 and 9.60 percent in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively. The protein content of albumen in egg pickle increased significantly ($p<0.05$) to 10.56, 10.92, 11.03 and 10.98 percent in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively after 30 days storage at ambient temperature. There was non significant decrease ($p<0.05$) in protein content of the egg yolk during storage. The average protein content of egg yolk on the preparation day was 14.93, 14.66, 15.04 and 15.12 percent in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively. The protein content of yolk in egg pickle decreased non significantly ($p<0.05$) to 13.32, 13.78, 14.21 and 14.28 percent in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively after 30 days storage at ambient temperature. (Table 2)

The increase in protein content of the egg albumen during storage could be due to the was decrease of loss of moisture in egg albumen during storage, and on the contrary the increase in moisture content of egg yolk resulted in decrease in protein content of the egg yolk during storage of the egg pickle. Similar results about variation in protein content of egg for egg pickle, during storage were reported by singh at el (1988).

Fat

There was significant increase ($p<0.05$) in fat content of the egg albumen during storage. The average fat content of egg albumen on the preparation day was 1.23, 1.43, 1.46 and 1.38 percent in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively. The fat content of albumen in egg pickle increased significantly ($p<0.05$) to 2.09, 1.96, 2.06 and 2.11 percent in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively after 30 days storage at ambient temperature. There was non significant increase ($p<0.05$) in fat content of the egg yolk during storage. The average fat content of egg yolk on the preparation day was 10.96, 11.02, 10.86 and 10.78 percent in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively. The fat content of yolk in egg pickle increased non significantly ($p<0.05$) to 11.21, 11.32, 11.09 and 10.99 percent in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively after 30 days storage at ambient temperature.(Table 2)

Ash Content

There was non significant increase ($p<0.05$) in ash content of the egg albumen during storage. The average ash content of egg albumen on the preparation day was 0.59, 0.61, 0.61 and 0.62 percent in egg pickle marinated in mustard oil, groundnut oil, soya bean oil and palm oil respectively. The ash content of albumen in egg pickle increased non significantly ($p<0.05$) to 0.65, 0.64, 0.65 and 0.67 percent in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively after 30 days storage at ambient temperature. There was non significant decrease ($p<0.05$) in ash content of the egg yolk during. The average ash content of egg yolk on the preparation day was 1.27, 1.42, 1.08 and 1.35 percent in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively. The ash content of yolk in egg pickle decreased non significantly ($p<0.05$) to 0.98, 1.16, 0.96 and 0.99 percent in egg pickle marinated in mustard oil, groundnut

oil, soyabean oil and palm oil respectively after 30 days storage at ambient temperature.(Table 2)

Microbiological Analysis of Chicken Egg Pickle

The average total viable count (TVC) of chicken egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil was 2.16, 1.97, 2.08 and 2.11 respectively on the day of preparation. The average total viable count of the egg pickle increased significantly ($p \leq 0.05$) to 2.31, 2.25, 2.28 and 2.31 in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively after 45 days of storage period at ambient temperature.(Table 1)

Sensory Evaluation

The average appearance scores of chicken egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil was 8.27, 8.18, 8.22 and 8.18 respectively on the day of preparation. The average appearance scores of the egg pickle decreased significantly ($p \leq 0.05$) to 7.75, 7.68, 7.81 and 7.73 in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively after 45 days of storage period.(Table 3)

The average color scores of chicken egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil was 8.51, 8.57, 8.53 and 8.58 respectively on the day of preparation. The average color scores of the egg pickle decreased significantly ($p \leq 0.05$) to 8.19, 8.25, 8.22 and 8.26 in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively after 45 days of storage period.(Table 3)

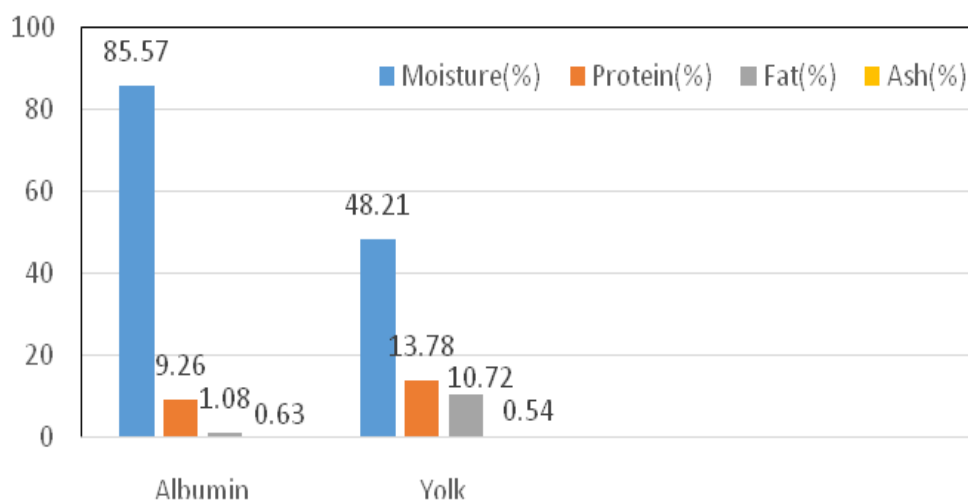
The average flavor scores of chicken egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil was 8.68, 8.51, 8.42 and 8.46 respectively on the day of preparation. The average flavor scores of the egg pickle decreased significantly ($p \leq 0.05$) to 7.96, 8.01, 7.93 and 8.06 in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively after 45 days of storage period.(Table 3)

The average taste scores of chicken egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil was 8.83, 8.69, 8.65 and 8.53 respectively on the day of preparation. The average taste scores of the egg pickle decreased significantly ($p \leq 0.05$) to 8.08, 8.13, 8.06 and 8.15 in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively after 45 days of storage period.(Table 3)

The average overall acceptability scores of chicken egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil was 8.73, 8.68, 8.64 and 8.59 respectively on the day of preparation. The average overall acceptability scores of the egg pickle decreased significantly ($p \leq 0.05$) to 8.19, 8.14, 8.08 and 8.23 in egg pickle marinated in mustard oil, groundnut oil, soyabean oil and palm oil respectively after 45 days of storage period.(Table 3)

CONCLUSIONS

It was concluded that good quality of chicken egg pickle can be prepared by using refined mustard oil, groundnut oil, soyabean oil and palm oil. The stability of chicken egg pickle marinated in palm oil was significantly ($p \leq 0.05$) higher than chicken egg pickle marinated in groundnut oil, mustard oil and soyabean oil. There was non-significant effects of packaging material i.e. glass and PET (Polyethylene Terephthalate) containers on the quality and stability of chicken egg pickle. The chicken egg pickle stored at ambient temperature (25-28°C) were acceptable organoleptically upto 45 days of storage. The quality of chicken egg pickle was evaluated upto 90 days of storage period at refrigeration temperature (5-7°C). The pickle prepared in all the four oils was acceptable upto 90 days of refrigeration storage period.



Graph 1: Proximate Composition of Fresh Hard Cooked Chicken Eggs

Table 1: Effect of Storage on TVC (Log CfU/Gm) of Chicken Egg Pickles

Days	Mustard Oil	Groundnut Oil	Soyabean Oil	Palm Oil
0	2.16±0.03	1.97±0.04	2.08±0.03	2.11±0.01
15	2.24±0.04	2.09±0.02	2.18±0.01	2.19±0.04
30	2.30±0.02	2.19±0.03	2.23±0.04	2.26±0.02
CD (p≤0.05)	0.03	0.04	0.05	0.04

Table 2: Effect of Storage on Different Proximate Analysis

Marinating Oils		Moisture			Protein			Fat			Ash		
		0 day	15 day	CD (p≤0.05)	0 day	15 day	CD (p≤0.05)	0 day	15 day	CD (p≤0.05)	0 day	15 day	CD (p≤0.05)
Mustard Oil	Albumin	86.31±0.12	79.41±0.16	1.37	9.41±0.08	10.56±0.09	0.96	1.23±0.03	2.09±0.04	0.47	0.59±0.02	0.65±0.03	NS
	Yolk	46.78±0.07	49.23±0.05	1.66	14.93±0.11	13.32±0.10	1.32	10.96±0.06	11.21±0.05	NS	1.27±0.02	0.98±0.01	NS
Groundnut Oil	Albumin	85.89±0.07	78.86±0.10	2.20	8.96±0.10	10.92±0.10	1.59	1.43±0.02	1.96±0.01	NS	0.61±0.03	0.64±0.04	NS
	Yolk	48.44±0.06	51.03±0.07	NS	14.66±0.09	13.78±0.07	NS	11.02±0.02	11.32±0.01	NS	1.42±0.03	1.16±0.02	NS
Soyabean Oil	Albumin	87.03±0.06	84.28±0.08	1.21	9.27±0.11	11.03±0.10	1.33	1.46±0.06	2.06±0.05	0.28	0.61±0.04	0.65±0.05	NS
	Yolk	47.76±0.07	47.76±0.07	NS	15.04±0.10	14.21±0.08	NS	10.86±0.04	11.09±0.05	NS	1.08±0.03	0.96±0.02	NS
Palm Oil	Albumin	86.49±0.03	78.22±0.02	1.70	9.60±0.08	10.98±0.07	1.27	1.38±0.04	2.11±0.03	0.54	0.62±0.01	0.67±0.02	NS
	Yolk	46.92±0.011	48.11±0.10	NS	15.12±0.12	14.28±0.11	NS	10.78±0.03	10.99±0.02	NS	1.35±0.01	0.99±0.02	NS

N=3

Table 3: Effect of Storage on Different Sensory Parameters

Marinating Oils	Appearance			Colour			Flavour			Taste			Overall Acceptance		
	0 day	15 day	30 day	0 day	15 day	30 day	0 day	15 day	30 day	0 day	15 day	30 day	0 day	15 day	30 day
Mustard Oil	8.27±0.03	8.03±0.05	7.86±0.04	8.51±0.05	8.44±0.06	8.32±0.07	8.68±0.05	8.38±0.04	8.19±0.03	8.83±0.03	8.62±0.04	8.25±0.02	8.73±0.03	8.55±0.02	8.44±0.04
Groundnut Oil	8.18±0.03	8.22±0.05	8.18±0.05	8.57±0.06	8.49±0.07	8.35±0.05	8.51±0.04	8.41±0.02	8.21±0.03	8.69±0.03	8.59±0.04	8.20±0.05	8.68±0.04	8.53±0.01	8.39±0.03
Soyabean Oil	8.04±0.02	8.01±0.04	8.07±0.03	8.53±0.03	8.47±0.04	8.33±0.05	8.42±0.03	8.32±0.02	8.17±0.04	8.65±0.02	8.38±0.01	8.18±0.04	8.64±0.02	8.51±0.01	8.34±0.02
Palm Oil	7.79±0.03	7.96±0.03	7.85±0.04	8.58±0.08	8.48±0.07	8.37±0.06	8.46±0.02	8.38±0.01	8.24±0.03	8.53±0.02	8.42±0.04	8.23±0.01	8.59±0.03	8.51±0.01	8.48±0.02

N=3

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